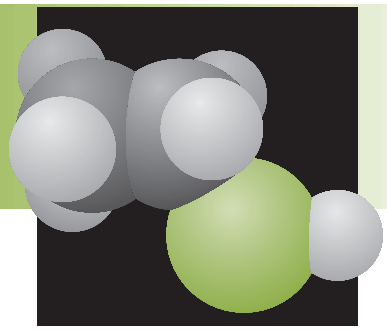
CHEMICALS
Project Fact Sheet



Chemicals for Brightness Stabilization of High Yield Bleaching Paper

Benefits

- Energy savings of 35 trillion Btu per year
- Waste reduction of 8.4 million tons per year
- Production cost savings of $165 million per year
- Produces more useful pulp per ton of wood
- Eliminates chlorine from bleaching process

Applications

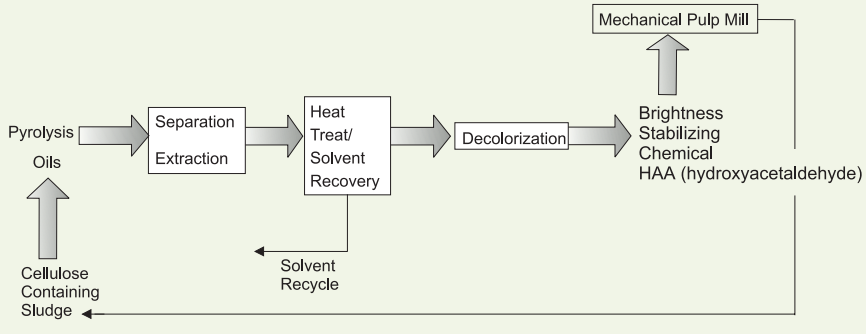
Primary application of B-TMP is in Kraft pulping mills. The industry will apply this technology by recycling its cellulosic wastes as feedstock, and using the brightness stabilizer derived from those wastes to control yellowing in mechanical pulp.

Inexpensive additives minimize yellowing of mechanical pulp paper products

Bleached thermomechanical pulp (B-TMP) technology is a mechanical process for producing a high yield of paper pulp with fewer environmental impacts when compared with conventional Kraft chemical pulping processes. Mechanical pulping reduces the production of waste water and lowers emissions of sulfur dioxide and chlorinated compounds to nearly zero. Mechanical pulping is also appropriate for lower-quality hardwoods grown on plantations, and avoids the cutting of high-quality softwoods from national forests. Unfortunately, the B-TMP process tends to produce pulp that yellows if exposed to sunlight or moderate temperatures, reducing the value of manufactured paper products.

Brightness stabilizers added to retard the yellowing effect have proven too expensive until recently. Researchers have isolated chemicals from pyrolysis oils that are effective in retarding yellowing and relatively inexpensive. Moreover, pulping waste can be recycled as a feedstock for producing the pyrolysis oils, which would help to alleviate current problems associated with disposal of this sludge. Implementing B-TMP (with inexpensive brighteners) in existing Kraft pulp mills could reduce energy use, increase pulp yield per ton of wood, reduce waste generation, and lower production costs. The process also eliminates the need for chlorine bleaching and the associated environmental impacts.

Brightness Stabilization Production



Inexpensive process produces brightness stabilizing chemical from pulp sludges, allowing greater use of mechanical pulping and eliminating the need for chlorine bleaching.

Project Description

Goal: To validate the technical and economic potential of deriving chemicals from biomass pyrolysis for photostabilization of bleached thermomechanical pulps.

Since 1996, investigators have pursued the potential for using biomass and recycled sludge from pulp and paper mills as feedstock for producing chemicals. A component of pyrolysis oils, hydroxyacetaldehyde (HAA), has been identified as a potential brightness stabilizer for B-TMP. A primary goal of the project is to develop a high-yield method to isolate and recover HAA as a colorless solution so that it is available and inexpensive for industry to use. Work is being conducted under a Cooperative Research and Development Agreement (CRADA) between Mineral Technologies, Inc. (MTI) and the National Renewable Energy Laboratory (NREL). NREL's innovative method for obtaining HAA from pyrolysis oils requires four steps: separation of the heavy lignin-derived product, extraction with an organic solvent, heat treatment to recover the solvent and thermally stabilize the solutions, and decolorization with carbon. NREL has focused particularly on the decolorization step, where a portion of the active chemicals is lost due to their absorption by the carbon. MTI is comparing the solutions derived by NREL to pure solutions of HAA. The company is also studying the interactions between the brightness stabilizer and other paper additives.

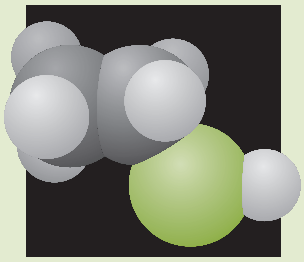
Future tasks include preparation of brightness-stabilizer solutions from low-cost, high-cellulose-content feedstocks; improvement in the decolorization step of the solutions; evaluation of the effectiveness and interaction of the stabilizer solutions; and analysis of the technoeconomic aspects of the process.

Progress and Milestones

- NREL and MTI have demonstrated proof-of-concept of a laboratory process that provides yields of HAA from biomass-derived pyrolysis oils that are 2.5 times greater than those previously reported.
- NREL has made improvements to three of the four steps to isolate HAA from pyrolysis oils (neglecting separation of the lignin-derived product, since this technology is available commercially).
- NREL has discovered that water helps recover as much as 50 percent of the absorbed active chemicals from the carbon and minimizes the amount of color desorbed from the carbon.
- The brightness stabilizer has been shown to be effective at low concentrations.
- Successful commercialization is anticipated as production of the brightness stabilizer will be an extension of business already underway at MTI, and MTI's customers have expressed a need for this product.

Patent Application

- A patent application has been filed for the process of isolating a brightness stablizer from biomass-derived pyrolysis oils.



Project Partners

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February 1999